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THE PRACTICAL WORKINGS OF THE "SURFACE PRIVY" AND THE "LIME SYSTEM."

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In a former article[a] attention was called to the fact that the surface privy is in very common use and that some persons advise that lime be applied in treating the night soil. The present article gives observations upon this system as actually practiced.

For purpose of study a certain industrial village of about 100 houses was selected, in which the lime system and surface privies have been in use for a number of months. The outhouses are cleaned once a week and lime is distributed free to the families; the latter have been notified repeatedly that it should be used regularly and generously, and the village authorities emphasized the fact to us that all reasonable efforts were made to carry out the system properly. It would seem, therefore, that this village is a fair case to take as basis for observations as to the actual workings of the system.

Just before the privies received their weekly cleaning, 88 toilets, belonging to 88 inhabited houses, were examined. In 32 cases it was found that the families had actually used the lime which was furnished to them; if the remaining 56 families had used it, no evidence of that fact was apparent. The conclusion would therefore appear justified that even if lime is furnished free of cost and even if the families are repeatedly urged to use it as a practical sanitary precautionary measure, the system is not generally adopted.

Of the 32 outhouses in which lime has been used, it was used freely in only 3 instances. The conclusion therefore seems justified that when the lime is used familes can not be relied upon to use it properly.

In not a single instance did we fail to find exposed night soil of easy access to flies and other insects, which were observed feeding in 85 of the 88 toilets examined. Flies feeding on the feces were not observed in 2 of the limed privies and in 1 of the unlimed toilets, but other insects were present in all 3 of these cases.

Samples of night soil were taken to the laboratory from 2 limed and from 2 unlimed privies, in the hope of obtaining a supply of hookworm eggs. Live fly larvæ were found in all 4 samples. Live hookworm eggs were found in 3 samples (1 limed, 2 unlimed). After the toilets were cleaned, samples of sand were taken from under the seat of 1 privy in which lime had been used and 1 in which it had not been used; in both instances live nematode embryos and larvæ, apparently hookworms, were found. The conclusion is thus justified that even when the lime is used, at least as found in these cases, both live fly larvæ and live hookworm eggs, embryos, and larvæ may be found. Our observations indicate, however, that there are in general fewer flies on the limed than on the unlimed night soil.

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[a] The Sanitary Privy<Public Health Reports, v. 25 (17), April 29, 1910, pp. 545-552, figs. 1-4.

The practical workings of the cleaning process were next observed. As the cleaner went from place to place, he shoveled the night soil into an ordinary open dump cart, smoothed over the dirt under the privy seat, and placed a fresh supply of lime in the outhouses. As he was under close observation it is to be assumed that he did his work at least as thoroughly as usual. As he disturbed the excreta under the seat, a number of flies would rise; part of these would settle in the cart, part would return to the outhouse, and part would fly in various directions, including the direction toward the kitchen. Upon finishing with an outhouse, the cleaner then drove his wagon, containing excreta and flies, to the next privy. Here he disturbed the flies in the wagon by taking out his implements; part of the flies settled again on the feces in the cart, part flew off in various directions, as toward the privy or toward the kitchen. As the cleaner now started to clean the privy, more flies would be disturbed and scattered; as he shoveled the excreta into the cart, part of the filth would fall upon the ground and the rest would disturb the swarm of flies which were feeding on the night soil in the cart. This resulted in another general redistribution of flies from the cart to the privy, the kitchen, the cart, etc.

Finally, the man started through the village with his wagon load of night soil and flies and drove to the dump. To observe the insects it was now necessary to follow close behind the wagon. A light breeze was blowing and the road was, here and there, not very smooth.

As the cart proceeded on its way, many of the flies deserted it to scatter toward the houses and elsewhere. Part of the excreta was shaken through the cart and dropped on the road. When we arrived at the dump there was still a good supply of flies in the wagon, but they were relatively few in number as compared with the original swarm.

The dump also had its swarm of flies. These were naturally disturbed as the cleaner dumped the night soil from his cart; part of this swarm settled again on the dump, part on the soiled cart, and part flew off. Then the cart proceeded back to the village with its new supply of flies, part of which deserted the wagon as it passed one house after another.

Thus, the cart acted as a distributor of flies between the village and the dump, and between the various privies and houses.

The possibilities of distributing filth and infections by the procedure here described are self-evident.

Various species of insects were seen during these observations, but most of the flies seemed in appearance to resemble the so-called "common house fly" (*Musca domestica*). If the public could be brought to a full understanding of the filthy habits of this creature, its breeding places would soon be lessened in number. In the particular village under observation, the common breeding place was undoubtedly the surface privy and the dump. In addition, these filth flies were also breeding elsewhere, as in manure.

The advantages of the surface privy can be summarized in the simple statement that although it is a miserable substitute for a sanitary privy it is a great improvement over the promiscuous defecation which occurs around 55 per cent of the 4,645 farmhouses of which we have record.

Among the disadvantages of the surface privy may be mentioned:

(1) It is a great breeding place for flies, and therefore a great reservoir from which intestinal bacterial infections may be spread.

(2) It forms a developing place for hook worms, amebic dysentery, Cochin-China diarrhea, and certain other zooparasitic diseases, second only to promiscuous defecation.

(3) Soil pollution extends beyond the surface privy as the latter is emptied.

(4) It can not be thoroughly cleaned by any practical method.

(5) The privy soon falls out of repair, because the cleaning process undermines the base of the structure, so that the outhouse soon settles back, pulling the boards apart, and even splitting the seat. In the end, therefore, it is an extravagant structure.

(6) It can not be kept without odor.

(7) It is an eyesore, and therefore greatly detracts from the appearance of the village.

For the particular State in which the foregoing observations were made we have records covering 1,501 farmhouses, 62.8 per cent of which have no privy of any kind; of the farmhouses in question tabulated as occupied by whites 40.2 per cent have no outhouse, and those tabulated as occupied by negroes 88.3 per cent have none.

For this same State we have records of the toilet system in 17 industrial villages, and of these 15 villages have the surface privy.

The typhoid index of the State in question is, according to the Twelfth Census, 66 deaths per year per 100,000 inhabitants.

The advantages of the lime system, as observed, are:

(1) It results in a slight decrease in flies.

(2) It results in a slight decrease in the odor.

Among the disadvantages of the lime system may be mentioned:

(1) This (like any other similar "dry" system, as, for instance, the dry earth system) is dependent upon the cooperation of the entire public (children as well as adults) using the outhouses, and experience shows that this cooperation is not to be relied upon.

(2) It does not prevent either fly breeding or fly feeding.

(3) It does not prevent the development of intestinal worms.

(4) It therefore gives to the public a false sense of security.

The theoretically and practically ideal and the universally applicable system of caring for the night soil has not yet been discovered. At present it is more a question of selecting the least objectionable rather than the most satisfactory system, and this point may vary according to local conditions. Even the details of construction of a privy may depend to some extent upon the question of the presence or absence of an alley back of the yard.

The fact appears, however, to be established beyond question that the surface privy (with or without either lime or dry earth), although a great improvement over promiscuous defecation, is dangerous both to public and to private health, and that where a sewer system is not feasible (for financial or other reasons), the surface privies should, without further delay, be remodeled into the tub, pail, or barrel system.

Just what material (lime, earth, carbolic acid, cresol, water and kerosene, etc.) it is best to use in the tubs may for the present in the interest of conservatism be considered *sub judice*, pending further experiments. It is possible to raise objections, both of a theoretical and of a practical nature, to all of these materials. Leaving a more detailed discussion of these matters to later reports in which we hope to give the results of further experiments, we feel justified at present in mentioning the following points:

The use (in the tub) of any one of the substances mentioned in the foregoing paragraph is an improvement over the use of the tub without any safeguarding material. The present widespread faith in lime and in earth is not so fully grounded, either theoretically or practically, as seems to be popularly supposed. Although we personally do not know of any accidents that have occurred from the use of carbolic acid in privy tubs (a custom extending back thirty years or more) possibilities of accidents occur to us which justify a warning for caution. The danger of fire in connection with the water and kerosene method (a method based on the well-known use of kerosene against mosquitoes) has not yet materialized in our tests to light the kerosene film by throwing in burning matches and lighted tobacco. As already mentioned in an earlier article, if a fluid system is adopted, the tub should be deep and it's top should come close to the seat. In connection with the breeding and feeding of insects in exposed or buried feces, flies are by no means the only insects which come into both practical and theoretical consideration, and our observations indicate a need for further studies along these lines. Our observations to date indicate that with the water and kerosene method, (1) flies which attempt to feed on particles of floating feces are (always?) overcome by the effects of the oil, (2) dead hook-worm eggs are found beginning with the fourth day, (3) the development of the eggs is retarded, even in very warm weather, so that at the end of seven days embryos have not been found, (4) it is not safe to empty the tub on a field at the end of a week (the usual time recommended for cleaning the privy) as live hook-worm eggs may still be present in large numbers, despite the fermention which has occurred. (How long it is necessary to ferment the night soil, at different seasons of the year, in order to kill these eggs, will be reported later.)